<u>CLAIMS</u>

1	1. A method of scheduling operations for logical volumes in a data storage system
2	comprising:
3	determining, for a plurality of priority classes, which operations associated
4	with each of the priority classes in the plurality of priority classes have been requested for
5	a logical volume; and
6	selecting one of the operations by performing a probability-based operations
7	lookup based on the determination.
1	2. The method of claim 1, wherein the probability-based operations lookup comprises
2	using a table of entries corresponding to different operations, further comprising:
3	forming a plurality of first selection values, one corresponding to each of the
4	priority classes in the plurality of priority classes, based on the determination;
5	selecting one of the priority classes in the plurality of priority classes based on
6	the determination; and
7	selecting a corresponding one of the plurality of first selection values
8	corresponding to the selected one of the plurality of priority classes as a lookup index
9	pointing to one of the entries.
1	3. The method of claim 2, wherein the probability-based operations lookup comprises a
2	first lookup level corresponding to a probability-based priority class lookup and a second
3	lookup level corresponding to the probability-based operations lookup, and wherein
4	selecting one of the priority classes in the plurality of priority classes comprises:
5	deriving a second selection value from the first selection values; and
6	using the second selection value as a first lookup index at the first lookup
7	level and using the selected one of the first selection values as an second lookup index at
8	the second lookup level.

4. A method of scheduling a requested operation comprising:

determining, for a plurality of priority classes, which operations associated with each of the priority classes in the plurality of priority classes have been requested;

selecting one of the operations by performing a probability-based operations lookup based on the determination;

wherein determining comprises:

associating bitmaps with the priority classes, the bitmaps having bits corresponding to available operation types within the priority classes with which the bitmaps are associated;

setting the corresponding bits for requested ones of the available operation types in one or more of the bitmaps to produce corresponding class_mask bitmap values; and

producing an operation_classes bitmap value from the class_mask bitmap values, the operation_classes bitmap value having a bit for each of the priority classes and set bits for any of the priority classes for which ones of the available operation types were requested.

5. The method of claim 4, wherein selecting comprises:

selecting one of the priority classes by using the operation_classes bitmap value as a pointer to an entry in a class scheduling table having rows of entries, each of the entries being assigned a single one of the priority classes based on predetermined probabilities associated with combinations of the priority classes.

6. The method of claim 5, wherein selecting further comprises:

selecting one of the operations for the selected priority class by using the corresponding class_mask bitmap value as a pointer to an entry in an operation scheduling table having rows of entries, each of the entries being assigned a single one of the operations based on predetermined probabilities associated with combinations of the operations.

1 7. The method of claim 6 further comprising: 2 generating a job for the selected one of the operations. 1 8. The method of claim 7, further comprising: 2 determining if the generated job is unsuccessful. 1 9. The method of claim 8, further comprising: 2 selecting a different one of the operations if the generated job is determined to 3 be unsuccessful. 1 10. The method of claim 9, wherein selecting a different one of the operations 2 comprises: 3 clearing the corresponding bit for the selected one of the operations in the 4 associated class mask bitmap for the selected priority class to produce a modified 5 corresponding class mask bitmap value, thereby removing the selected one of the 6 operations from further consideration. 1 11. The method of claim 10, wherein selecting a different one of the operations further 2 comprises: 3 producing a new operation classes bitmap value from the modified 4 corresponding class mask bitmap value and unmodified ones of the class mask bitmap 5 values. 12. An apparatus for scheduling operations for logical volumes in a data storage system, 1 2 comprising: 3 a stored computer program in memory instituting the steps of

4	determining, for a plurality of priority classes, which operations associated
5	with each of the priority classes in the plurality of priority classes have been requested for
6	a logical volume; and
7	selecting one of the operations by performing a probability-based operations
8	lookup based on the determination.
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1	13. An apparatus for scheduling a requested operation, comprising:
2	determining, for a plurality of priority classes, which operations associated
3	with each of the priority classes in the plurality of priority classes have been requested;
4	selecting one of the operations by performing a probability-based operations
5	lookup based on the determination;
6	wherein the instituted step of determining comprises:
7	associating bitmaps with the priority classes, the bitmaps having bits
8	corresponding to available operation types within the priority classes with which the
9	bitmaps are associated;
10	setting the corresponding bits for requested ones of the available operation
11	types in one or more of the bitmaps to produce corresponding class_mask bitmap values;
12	and
13	producing an operation_classes bitmap value from the class_mask bitmap
14	values, the operation_classes bitmap value having a bit for each of the priority classes
15	and set bits for any of the priority classes for which ones of the available operation types
16	were requested.
1	14. The apparatus of claim 13, wherein the program instituted step of selecting
2	comprises:
3	selecting one of the priority classes by using the operation classes bitmap
4	value as a pointer to an entry in a class scheduling table having rows of entries, each of
5	the entries being assigned a single one of the priority classes based on predetermined
6	probabilities associated with combinations of the priority classes.

- 1 15. The apparatus of claim 14, wherein the program instituted step of selecting further
- 2 comprises:
- 3 selecting one of the operations for the selected priority class by using the
- 4 corresponding class_mask bitmap value as a pointer to an entry in an operation
- 5 scheduling table having rows of entries, each of the entries being assigned a single one of
- 6 the operations based on predetermined probabilities associated with combinations of the
- 7 operations.
- 1 16. The apparatus of claim 15, further wherein the program institutes the step of
- 2 generating a job for the selected one of the operations.
- 1 17. The apparatus of claim 16, further wherein the program institutes the step of
- 2 determining if the generated job is unsuccessful.
- 1 18. The apparatus of claim 17, further wherein the program institutes the step of
- 2 selecting a different one of the operations of if the generated job is determined to be
- 3 unsuccessful.
- 1 19. The apparatus of claim 18, wherein the program instituted step of selecting a
- 2 different one of the operations comprises:
- 3 clearing the corresponding bit for the selected one of the operations in the
- 4 associated class mask bitmap for the selected priority class to produce a modified
- 5 corresponding class mask bitmap value.
- 1 20. The apparatus of claim 19, wherein the program instituted step of selecting a
- 2 different one of the operations further comprises:

- 3 producing a new operation_classes bitmap value from the modified
- 4 corresponding class_mask bitmap value and unmodified ones of the class_mask bitmap
- 5 values.